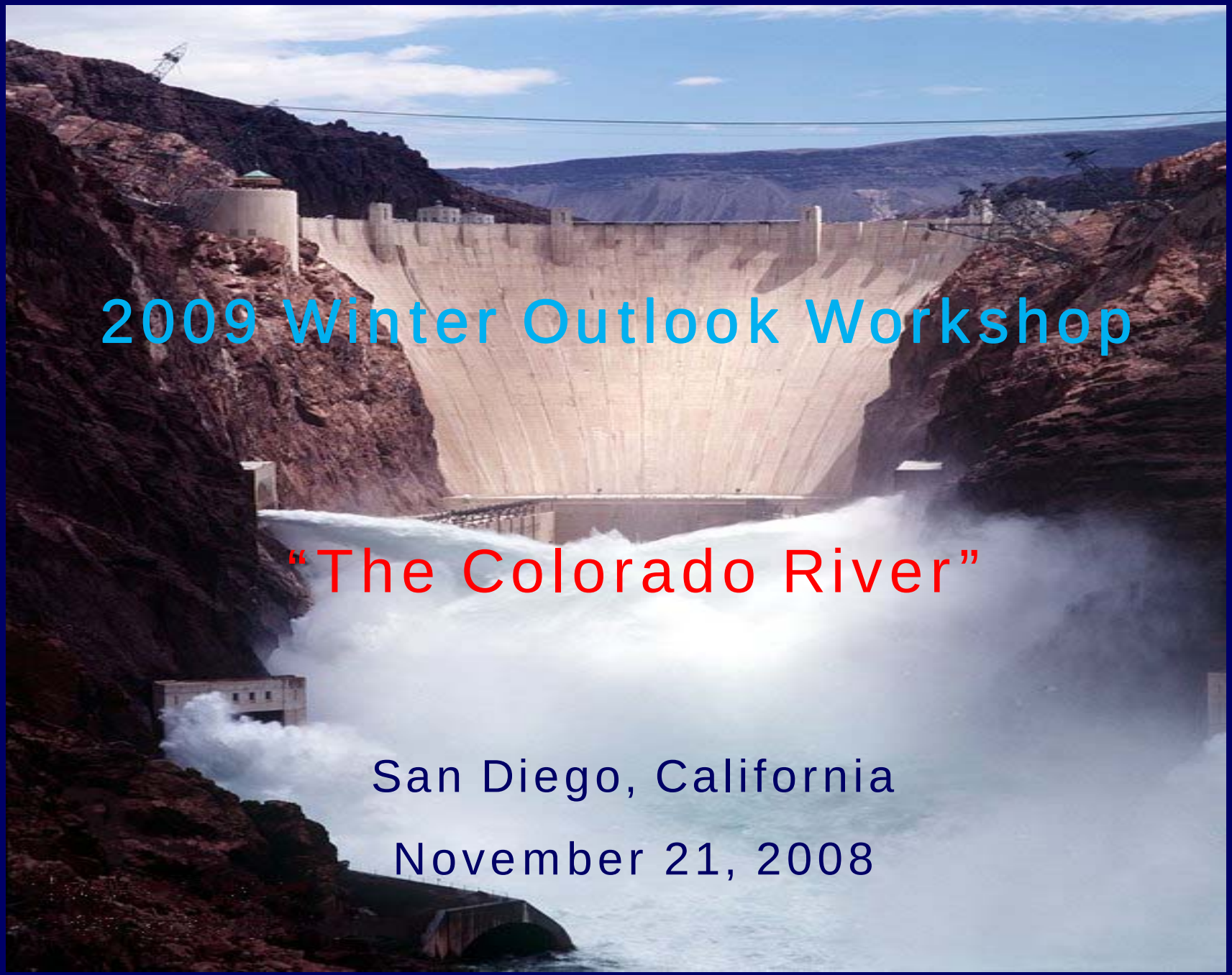
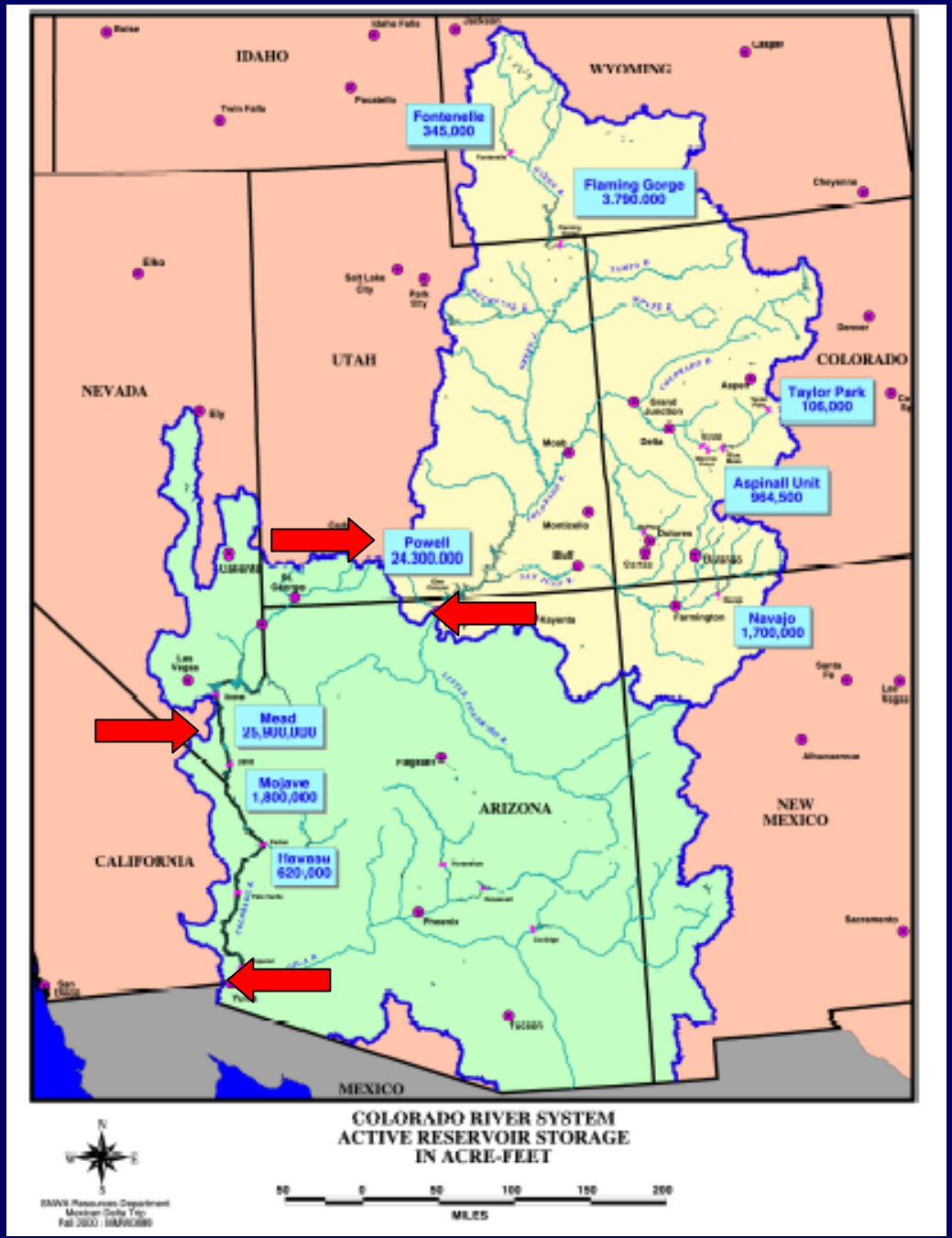


2009 Winter Outlook Workshop

"The Colorado River"

San Diego, California

November 21, 2008



- About 250,000 square miles
- Over 60 maf of storage
- Average annual virgin flow:
  - 15.0 maf at Lee Ferry
  - 16.4 maf at the NIB

Annual Apportionments

- 1922 Colorado River Compact
  - Upper Basin – 7.5 maf
  - Lower Basin – 8.5 maf
- 1944 Mexican Water Treaty
  - Normal annual entitlement -- 1.5 maf

- Total apportionment – 17.5 maf

Colorado River Mainstream Apportionments

- 1964 Decree in *Arizona v. California*
  - Arizona – 2.8 maf
  - Nevada – 0.3 maf
  - California – 4.4 maf

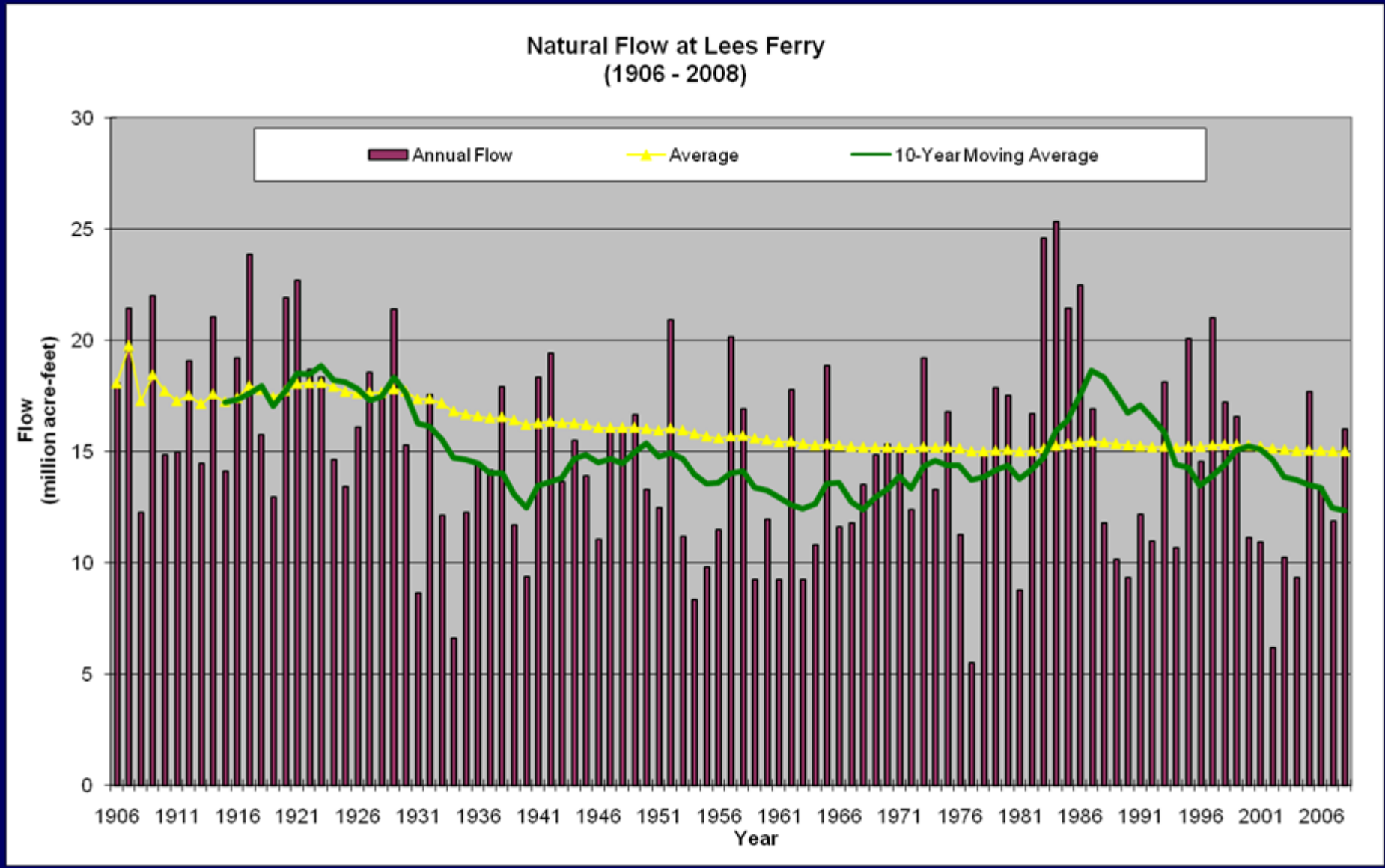
- Total apportionment – 7.5 maf


California Service Areas
NV
LAKE MEAD
HOOVER DAM
CA
LAKE MOHAVE
DAVIS DAM
AZ
COLORADO RIVER
CALIFORNIA AQUEDUCT
LAKE HAVASU
PARKER DAM
COACHELLA VALLEY W.D.
COLORADO R. AQUEDUCT
MWD
COACHELLA CANAL
PALO VERDE I.D.
SALTON SEA
IMPERIAL DAM
IMPERIAL I.D.
YUMA PROJECT
USA
MEXICO
ALL AMERICAN CANAL

Importance of the Colorado River

- Provides about 55 percent of the water used in southern California
  - Serves over 20 million people in seven counties
  - Provides water for about 900,000 acres of irrigated cropland
- Provides about 3.5 billion kwh of hydroelectric energy
- Supports fish, wildlife, and recreational resources
- Supports a southern California service area economy in excess of $850 billion

Historic Water Supply



Notes:

Water Year 2007 & 2008 flows are estimated

The average flow for 1906 – 2008 is 15.01 maf

Minimum 10-year period is 1999-2008 12.35 maf

Lake Powell Natural Inflow

	Lake Powell Inflow (maf)
Long-Term Avg. (1906-2008)	15.01
Avg. since Compact (1922-2008)	14.46
30-Year Avg. (1979-2008)	15.04
Max. 10-Year Avg. (1914-1923)	18.86
Min. 10-Year Avg. (1999-2008)	12.35
Max. of Record (1984)	25.30
Min. of Record (1977)	5.52
Last Year (2008)	15.84
Forecast this Year (2009)	??

Colorado River Conditions November 2008

Basin Hydrology
WY 2008 (10/1/08 through 11/14/08)

Precipitation

(Weighted Average 10/1 through 11/14) 79%

Snowpack Water Equivalent

(Weighted Average as of 11/14) NA%

Unregulated Inflow into Lake Powell

	MAF	% of Avg
2008 Apr-Jul Runoff	8.906	112%
2008 Water Year Runoff	12.356	102%

Storage Comparison

Reservoir	MAF	Elev. In Feet	% of Capacity
	(November 9, 2007)		
Lake Powell	11.776	3,600.3	48
Lake Mead	12.501	1,111.0	48
Total Sys. Storage	31.802	-	53
	(November 16, 2008)		
Lake Powell	14.058	3,622.7	58
Lake Mead	12.195	1,107.7	47
Total Sys. Storage	33.654	-	56

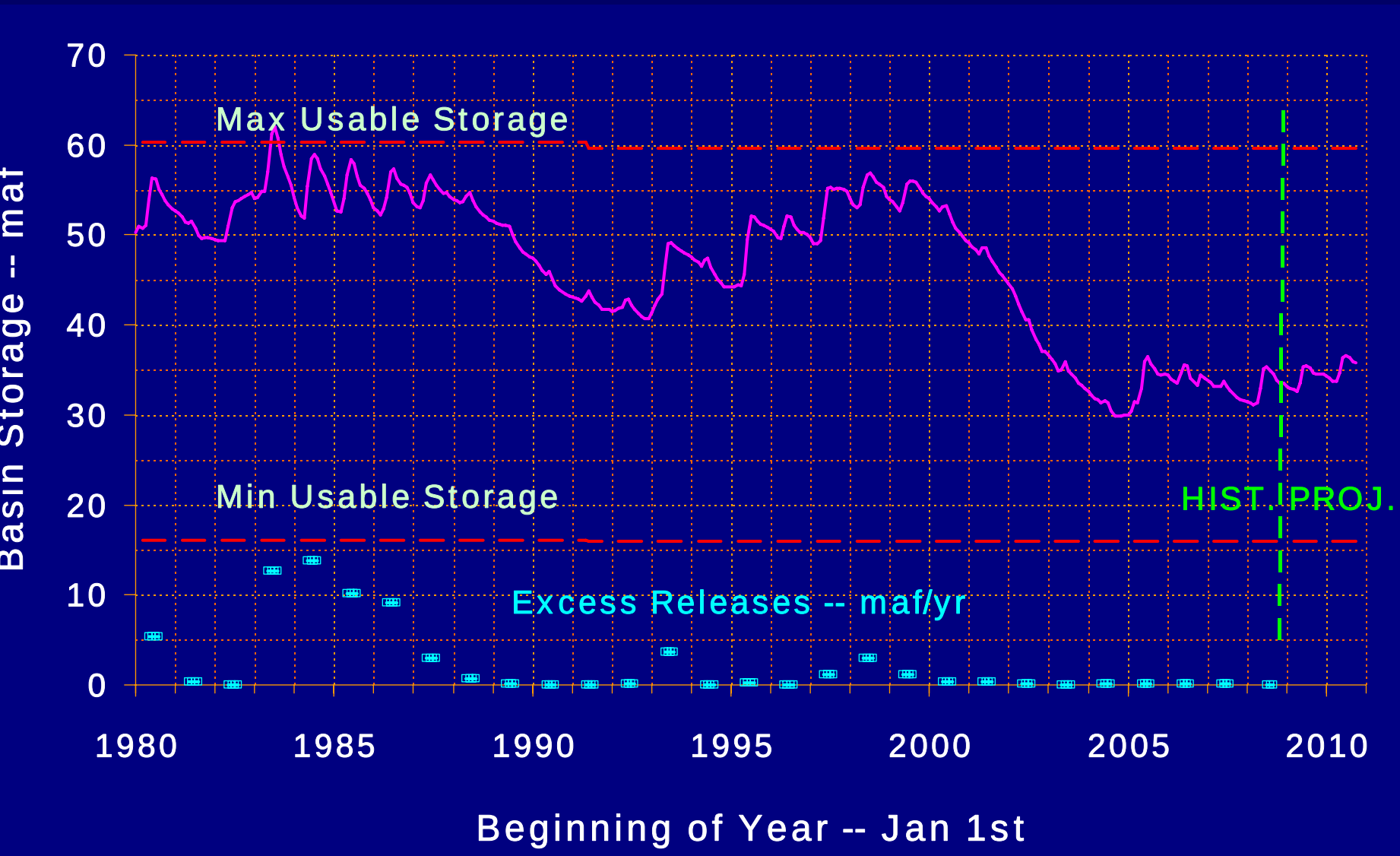
2008 Consumptive Use (USBR Estimate)

(Millions of Acre-Feet)

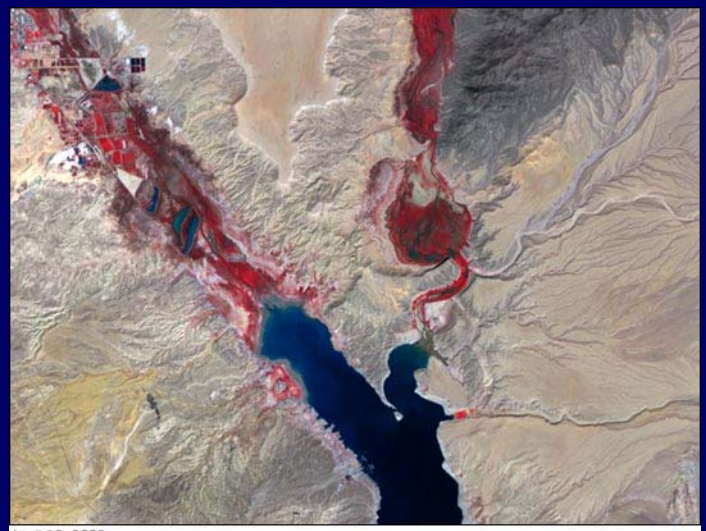
	2008	2007
Nevada (Total)	0.273	0.300
Arizona (Total)	2.775	2.746
California (Total)	4.498	4.356
Total LDS' Use	7.546	7.402

COLORADO RIVER BASIN STORAGE

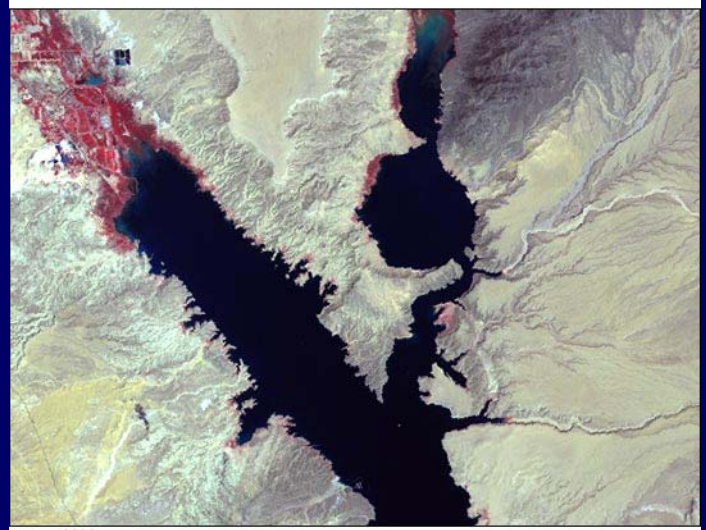
November 2008



What Does the Future Hold?



April 19, 2003



May 5, 2000

- Lake Mead elevation
  - May 2000 – 1208 ft.
  - April 2003 – 1153 ft.
  - Nov. 2008 – 1108 ft.

Interim Guidelines for Coordinated Reservoir Operations

- On December 13, 2007, Secretary Kempthorne released the ROD implementing Interim Guidelines on the Coordinated Operations of Lake Powell and Lake Mead and for Shortage Declarations in the Lower Basin
- This represents a historic agreement among the seven Colorado River Basin states on operations of the Reservoir System and in management Colorado River water in the Lower Basin

Pre-2007 Reservoir Operations

- Historically, Glen Canyon Dam and Hoover Dam have been operated as two independent reservoirs
- Glen Canyon Dam and Lake Powell to allow the Upper Basin to:
  - Meet the Upper Basin's delivery obligations to the Lower Basin
  - Continue to develop its 1922 Compact apportionment
- Hoover Dam and Lake Mead to:
  - Meet the downstream demands in the Lower Basin
  - Meet the 1944 Mexican Water Treaty delivery obligation to Mexico

Pre-2007 Reservoir Operations (continued)

- During a drought, Lake Powell would be drawn down first; possibly to critical water surface elevations while Lake Mead was relatively full
- However, when better hydrology was received, Lake Powell would refill while Lake Mead continued to be drawn down
- This operation, from a water management perspective, does not make sense

2007 Interim Guidelines

- Releases from Glen Canyon Dam are based upon:
  - Protecting critical water surface elevations at both Lake Powell and Lake Mead
  - Based upon sharing the pain of low runoff conditions at both reservoirs
  - Refilling both reservoirs simultaneously under good hydrologic periods
- Releases at Lake Mead are based upon:
  - Satisfying downstream demands under normal and surplus conditions
  - Stepped shortages to conserve water in both Lake Mead and Lake Powell under low runoff and low reservoir conditions

Lake Powell Elevation (feet)	Lake Powell Operational Tiers	Lake Powell Storage (maf)
3,700	**Equalization Tier** Equalize, Avoid Spills or Release 8.23 maf	24.3
3,636 - 3,666 (2008-2026)		15.5 - 19.3 (2008-2026)
3,626 ▼ as of 10/09/08	**Upper Elevation Balancing Tier**[1] Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	14.42 as of 10/09/08
3,595		11.3
3,575		9.5
3,560	**Mid-Elevation Release Tier** Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	8.3
3,525		5.9
3,490	**Lower Elevation Balancing Tier** Balance contents with a min/max release of 7.0 and 9.5 maf	4.0
3,370		0

[1] Subject to April adjustments that may result in balancing releases or releases according to the Equalization Tier.

Lake Mead Elevation (feet)	Lake Mead	Lake Mead Storage (maf)
1,220	Flood Control or 70R Surplus	25.9
1,200		22.9
	Domestic Surplus	
1,145		15.9
1,125	Normal Operations	13.9
1,107 as of 10/09/08		12.10 as of 10/09/08
1,100		11.5
1,075		9.4
	Shortage 333 kaf[1]	
1,050		7.5
	Shortage 417kaf[1]	
1,025		5.8
	Shortage 500 kaf[1] and Consultation[2]	
1,000		4.3
895		0

[1] These are amounts of shortage (i.e., reduced deliveries in the United States).

[2] If Lake Mead falls below elevation 1,025 ft msl, the Department will initiate efforts to develop additional guidelines for shortages at lower Lake Mead elevations.

Lake Mead Step Shortage		
Mead Elevation (ft)	Stepped Shortage	Mead Live Storage
1075 to 1050	400 kaf	9.37 to 7.47 maf
<1050 to 1025	500 kaf	7.47 to 5.80 maf
<1025 to 1000	600 kaf	5.80 to 4.33 maf
<1000	Consultations to determine if further reductions are warranted	<4.33 maf

- It is assumed that Mexico will share in the shortages

Intentionally Created Surplus

- The 2007 ROD provides the ability to create and store “Intentionally Created Surplus” water in Lake Mead
- ICS is created through:
  - Implementation of extraordinary conservation measures (land fallowing, canal lining, etc.)
  - Importation of Non-Colorado River System water (ground, surface, and desalted ocean water)
  - Participation in Colorado River System efficiency projects (Drop 2 Reservoir and funding operation of the Yuma Desalting Project

2009 Annual Operating Plan

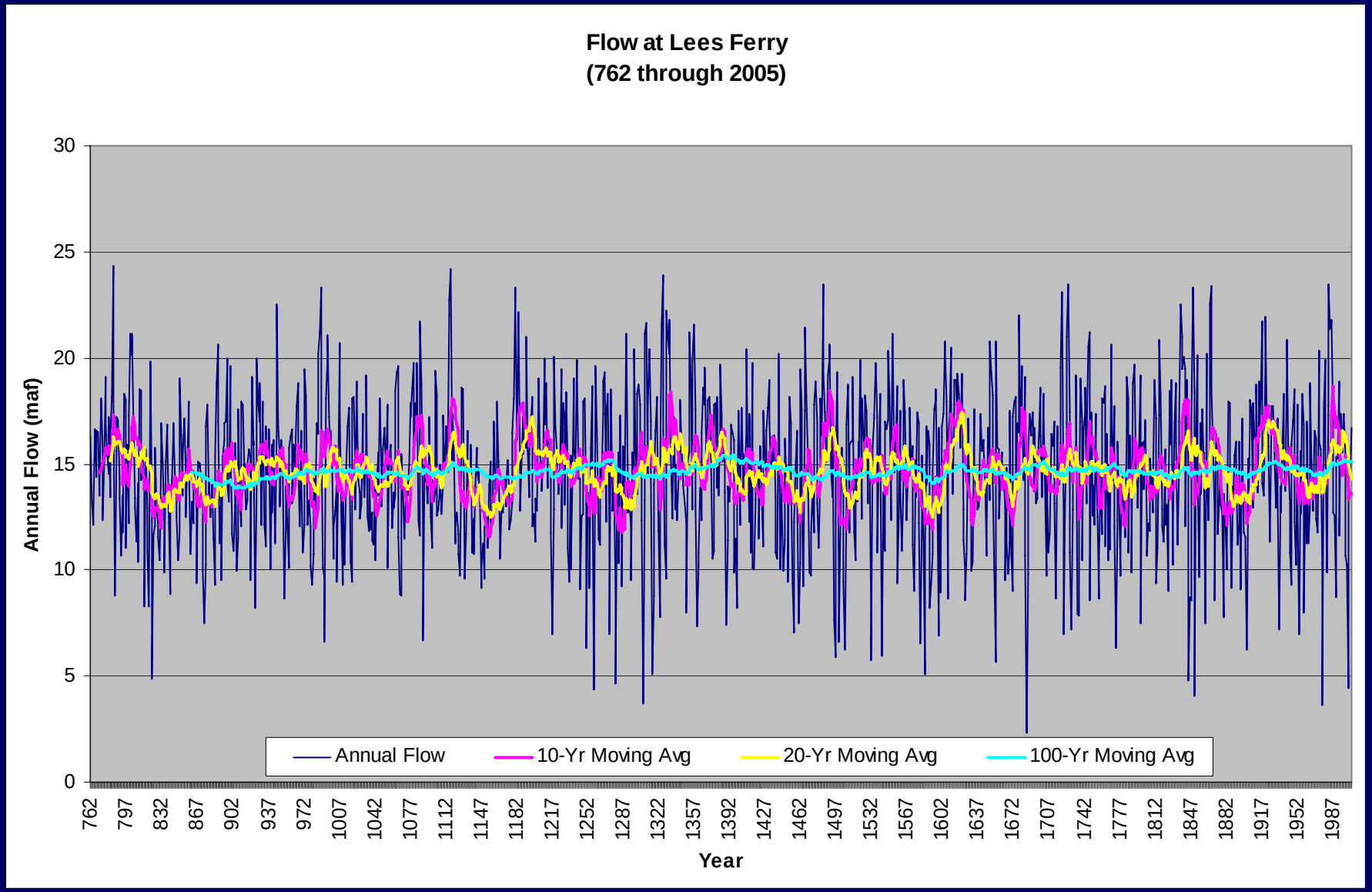
- Recommended AOP was forwarded to Secretary Kempthorne following October 24th CRMWG meeting
- Anticipated Secretary's determinations to be included in the 2009 AOP are:
  - Glen Canyon Dam releases – operated in the Upper Balancing Tier with a release of 8.23 maf, unless the April 2009 24-month study projects water surface elevation of Lake Powell to be above equalization trigger (3,639 feet) by the end of the water year
  - Hoover Dam releases – Normal releases to meet 7.5 maf demand on the mainstream in the Lower Basin, plus any requested ICS
  - Lower Division states allowed to utilize water apportioned to, but not used by, another Lower Division state
  - Mexico will be allowed to schedule the delivery of 1.5 maf

The Unknown Factors

- Increased water use in the Basin
- Affects of global warming and climate change
- Extent of climate variability based upon tree ring studies
- Environmental and other water demands

Tree Ring Studies

- Studies suggest:
  - Lower mean annual runoff
  - More frequent droughts
  - More severe droughts
  - Droughts of a longer duration

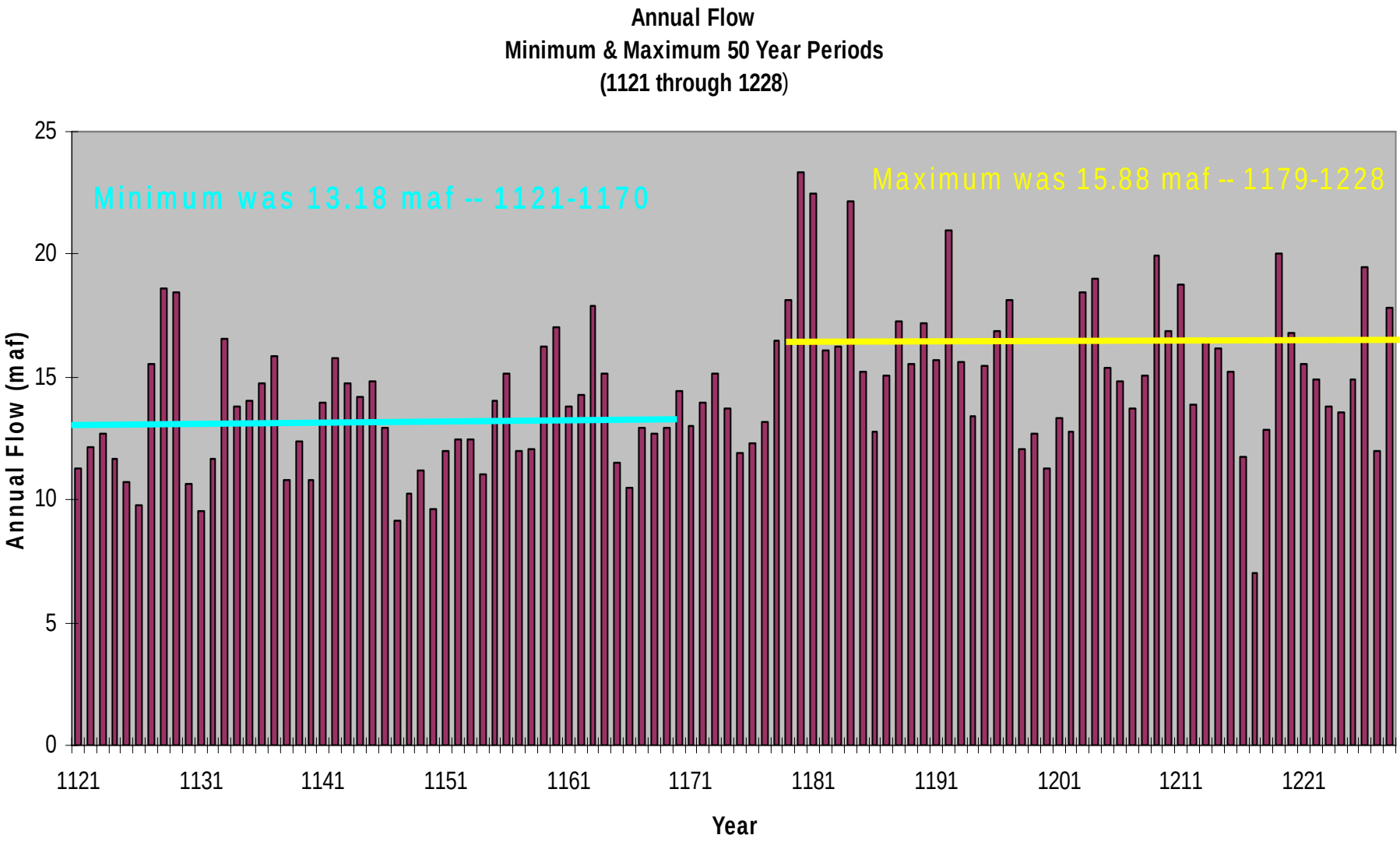


Notes: Data courtesy of D. Meko, Univ. Ariz., 2006

Long-term average was 14.66 maf

Maximum 100-year average was 15.39 maf (1289 to 1388)

Minimum 100-year average was 13.87 maf (812 to 911)



Notes:

1906 – 1955 was 15.50 maf

1959 – 2008 was 14.28 maf

Take Home Points

- The Colorado River is over appropriated
- The past ten years have been the worst drought in recorded history; however, storage on the reservoir system remains at 56% of capacity
- We do not know whether next year will be a continuation of the drought or a return to wetter years
- With average runoff, Lake Mead storage is expected to continue to drop
- For 2009, the California agencies will receive their basic apportionment of 4.4 maf, plus any ICS previously created by California agencies

Take Home Points
(continued)

- With implementation of the guidelines for coordinated operations for Lake Powell and Lake Mead and for shortage declarations in the Lower Basin by the Secretary of the Interior in December 2007, California is not expected to have a reduction in its 4.4 maf basic apportionment through 2026
- The long-term affects of climate variability, global warming, and climate change are yet to be determined

Questions?